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ABSTRACT

This guide is intended to help teachers learn about using special software tools for the World Wide Web. It makes use of the scientific data produced by the National Oceanic and Atmospheric Administration (NOAA) and other government agencies. Activities in this booklet include: (1) "Finding People in Cyberspace"; (2) "Finding Science on the Web"; (3) "The Space Shuttle"; (4) "Weather and Climate"; (5) "Finding Programs"; (6) "The Sun"; (7) "Hazards"; (8) "The Winds"; and (9) "Greenhouse Gases." (WRM)

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Science on the Web

Web Activities Using Scientific Data

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NOAA

Dr. Deborah McAlister and Lisa Richardson
University of Tennessee, Chattanooga

May 1998

Space Environment Center

DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration

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Available on the Web at http://www.sec.noaa.gov/Activities

To the Explorer

This Web product is a rework of the publication *Internet Activities Using Scientific Data*, by Stan Froseth and Barbara Poppe. That booklet is still in print and available to those who need to learn the UNIX-based Internet tools (ftp, gopher, telnet, talk, finger, etc.)

In this new product, all the tools are Web–browser based. Some of the exercises with data have changed so that we could use some of the wonderful Web pages out there.

Acknowledgments

Rob Wells provided the cartoons that brought "life" to Jane and Sandy. Barbara Poppe was forced to contribute the mice.

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Science on the Web

Introduction

The World Wide Web (WWW or "the Web") is a network of computers that exchange information stored in particular formats. And since much scientific data is now available on the Web, online information can be used for school projects and reports. Of course, there are many interesting things on the Internet, and all are available to you if you have the access, the tools, and the knowledge to locate the information.

The Internet is a global network of computers. According to Provenzo (1998, p. 6), the Internet is "a loosely configured system that connects millions of computers around the world." During the past 5 years, there has been an information explosion on the Internet, especially through home pages on the World Wide Web. Who knows what the next 5 years will bring?

This guide is intended to teach you how to use special software tools for the Web. It makes use of the scientific data produced by NOAA and other government agencies. Please make note that things are changing daily on the Web, and locations and sources can vary without notice, though many will specify a link to a new location. (Software is available on the market to do this for you automatically.) The tools, however, are expected to allow all the functions described within this guide. The purpose of this guide is really to empower you to explore the Web on your own. Once you have achieved independence, no amount of change in the Internet over the years will deter you.

There are several Web browsers available and generally free for educational use. The most common can be downloaded from the following URLs:

Netscape Navigator — **http://home.netscape.com/download/index.html**

Microsoft Internet Explorer — **http://www.microsoft.com/ie/download**

Mosaic — **http://www.ncsa.uiuc.edu/SDG/Software/Mosaic/NCSAMosaicHome.html**

Web-based tutorials can assist you, online, in learning about how to use the various Web tools. You might want to view the following Web page for assistance with Netscape

Doak, E. D. (1996). Tennessee TelTrain (T3) for World Wide Web (W3) with Netscape [Online]. Available: **http://web.utk.edu/~teltrain/**

Provenzo, E. F., Jr. (1998). The educator's brief guide to the Internet and the World Wide Web. Larchmont, NY: Eye on Education.

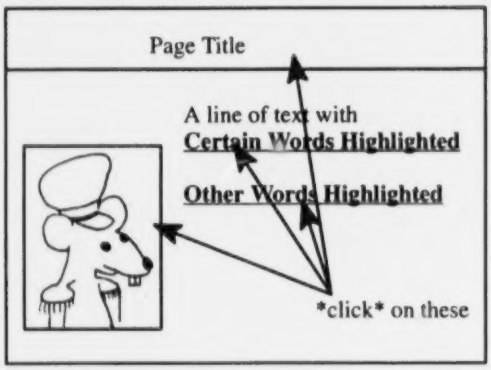
URLs are addresses and they take this form:

http://www.ngdc.noaa.gov/dmsp/ols-app-city.html

http://	is the service type
www.ngdc.noaa.gov	is the host (computer)
/dmsp/source/archive.html	is the path and file name

The initials **www** often appear in names of addresses, indicating that they are part of this World Wide Web system.

Hyperlinking



Hyperlinked documents have "hot spots" that are either words or pictures. When you click on a hot spot, other information or programs are called and you will see a new set of information. These are basically links to other documents.

By convention, if there are links in text, the text will be color, bold, or underlined to indicate that there are links available. Pictures are sometimes linked, so click on any of them and see what happens.

The top level page of a Web site is often called a "home page." Try using the **Back** button on your browser, or the Home link on the Web page

Navigating

*You'll probably find that you get lost a lot using **Netscape**. That's half the fun! But it's also nice to be able to get back quickly to an interesting place. Use the **Bookmarks** menu item to save the address of good spots.*

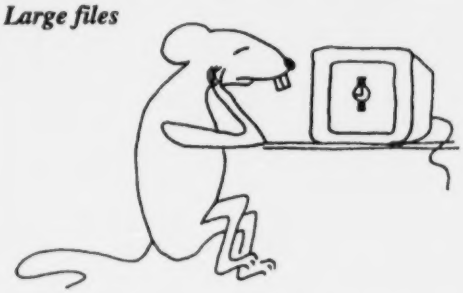
Later, you can get back using the Bookmarks menu item. Just select the Web destination that you saved.

Types of URLs

You can specify several service types:

http://	hypertext
ftp:// or **file://**	ftp
gopher://	gopher
telnet://	telnet

Large files



File size is significant if you are using a dial-up connection. Modem speeds make all the difference. How fast a transfer happens depends on the speed of your connection and the traffic on the Net.

Images require a lot *of capacity to send over the Net. That's why it often takes a long time to load a new page. You can use less of the Net's resources by turning off the images using the Options menu.*

Conventions

Before you get started, please take note of the following conventions used in this guide:

★ The names of URLs and links are printed in **boldface**.

★ Navigation will be by links, and they are underlined.
A list of links means to *click* on each link in turn as you go through the menus.

NOAA's (and other) Data

An important part of the mission of NOAA (National Oceanic and Atmospheric Administration, part of the Department of Commerce) is to describe, monitor, and predict changes in the Earth's environment. This involves making physical measurements, and also storing, interpreting, and disseminating the resulting data. NOAA uses the Internet to let people know what data sets are available and how they can be obtained. NOAA provides data in many different formats including printed pages, computer tapes, CD-ROM, and online. Here, we are primarily dealing with the online format: data that you can get directly into your computer via the Internet. The data available include the following:

NOAA's central Internet locator is **http://www.noaa.gov**. From this location on the World Wide Web, you can access all of NOAA's online data.

In addition, NOAA's data are used by many other organizations. For example, Michigan State University has taken satellite images and made them into weather movies. These are updated every three hours, and are available on the Internet.

Also referenced in this guide are data from the U.S. Geological Survey (USGS), the National Aeronautics and Space Administration (NASA), the National Center for Atmospheric Research (NCAR), and several universities. The extent of the total resources available on the Internet is truly unimaginable. These resources are at your fingertips once you learn the basic Web tools.

Files refered to as **pdf** files require Adobe Acrobat Reader. This reader is available free from
http://www.adobe.com/prodindex/acrobat/readstep.html

Netiquette

Whenever you are downloading from the Net, you open up your system to illegal software called viruses. Take precautions to protect your system. And when you've been infected and need to take the time to fix your system, consider how destructive and time-wasting this criminal type of hacking is.

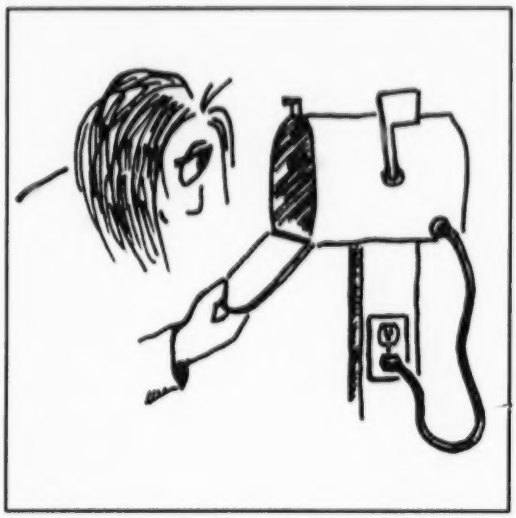
Interesting Sites

Try a few of these sites for some interesting browsing.

Space Environment Center	http://www.sec.noaa.gov
National Oceanic and Atmospheric Administration (NOAA) home page	http://www.noaa.gov
NASA Home Page	http://www.nasa.gov
JASON Electronic Field Trips	http://seawifs.gsfc.nasa.gov/scripts/JASON.html
NASA Spacelink	http://spacelink.nasa.gov
The Observatorium	http://observe.ivv.nasa.gov/observe.html
Questacon—National Science and Technology Centre, Australia	htttp://sunsite.anu.edu.au/Questacon
The Math Forum	http://forum.swarthmore.edu
Cornell Theory Center Math and Science Gateway	http://www.tc.cornell.edu/Edu/MathSciGateway
VolcanoWorld	http://volcano.und.nodak.edu
U.S. Geological Survey Hydroclimatology of San Francisco Bay	http://s101cascr.wr.usgs.gov/~mddettin
University of Arizona Students for the Exploration and Development of Space	http://seds.lpl.arizona.edu
The Exploratorium (San Francisco)	http://www.exploratorium.edu
U.S. House of Representatives	http://www.house.gov
U.S. Senate	http://www.senate.gov
U.S. Library of Congress	http://www.lcweb.loc.gov
Annenberg Science and Math Initiatives	http://www.c3.lanl.gov/~jspeck/SAMI–home.html
GLOBE Program (Global Learning and Observations to Benefit the Environment)	http://www.globe.gov
Monterey Bay Aquarium	http://www.usw.nps.navy.mil
Boulder (Colorado) Community Network	telnet:// or http://bcn.boulder.co.us
Cleveland Free-Net (with access to other community networks)	http://cnswww.cns.cwru.edu/net/easy/fn
Education Library	http://www.csu.edu.au/education/library.html

Science on the Web

Activity 1
Finding People in Cyberspace



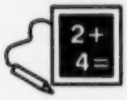
Jane's parents have been married for almost 25 years. A friend asked her if she was going to do anything for them on their 25th anniversary. Jane thought it would be a great idea to have a big surprise party, but how could she pull it off? She needed the help of other family members. Richard said he would be willing to throw rice, as long as he didn't have to dress up. That didn't help much. Then she thought of her Uncle Josh who lived in San Francisco. He might have some ideas. The big problem would be to get hold of him without making long-distance calls from home.

Today in school she learned about the Internet and that lots of universities are on the Internet. Uncle Josh works at Stanford University in the physics department. She didn't know his Internet address, but one of the examples at school gave an address for someone at Stanford.

She asked her teacher, Mrs. Fine, about finding an address of someone on the Internet. Her teacher said that you had to know the address, and that calling or writing the person and asking is usually necessary. Jane felt very disappointed, because this would be tough; she didn't even know his phone number. Mrs. Fine was concerned that a potential Internet user was backing away, but didn't know what she could do to help. Just to ease the situation, she asked Jane who she would like to contact. Jane said her uncle, Josh Salem...he works at Stanford in the physics department...she didn't know much more.

Mrs. Fine smiled and said that with a little guessing and a little "browsing," she could probably find the address. It would take them some time to poke around the Internet, so she told Jane said OK, but wasn't confident that this would work.

Soon after they sat down, Mrs. Fine and Jane found Uncle Josh's address: **jsalem@stanford.edu**. Jane first e-mailed her uncle, then browsed university sites and looked up friends all across the country.



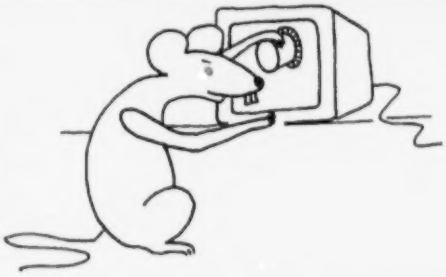
Starting the Browser

Login and start the browser

You will have to log in to get to the Internet, either when you get on your computer or when you try to connect to the Web. Your teacher should be able to help you do that.

login: ***your_login_name***
password: ***your_password***

Double click on **Netscape Communicator**
(You are welcome to use another browser, but the instructions will be a little different.)

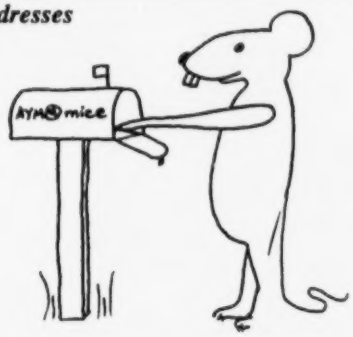


Who needs a secure password, anyway?
Remember that you are connecting to other computers, and they can be damaged in your name if your password is used by someone in an irresponsible way.
A safe password:
is not a word in the dictionary
has a number or punctuation in it
is 7 or 8 characters long

The mail feature

In the menu at the top select **Communicator—Messenger Mailbox**.
The Screen that comes up is your "inbox."
The top half of the screen shows the headers of messages you've received. One is usually highlighted.
The bottom half of the screen shows the contents of the message that is highlighted above.
Both windows scroll.

Addresses



Internet addresses are constructed in a very systematic way, and the system allows the Internet routers to find new addresses easily.

Let's look at ***test_email@sec.noaa.gov****: The address reads from the specific to the general, like a postal address; that is, if we start at the right:*

.gov	**government**
.noaa	**the organization or agency**
sec	**the computer or group name**
@	**separator**
test_email	**person's name (sometimes a function name, as this is)**

Some common domain extensions:

gov	*government*
org	*non-profit organization*
com	*commercial*
edu	*education (university/college)*

Sending a message

Click on the **New Msg** in the icon bar near the top of the window. A new window comes up.

In the **To**: line, type the address **test_email@sec.noaa.gov.**

You may enter text on the **Subject line**: but it is not required (it's part of the "header").

In the box below the Subject line, type your message ("message body"). You are sending a message to the authors of this guide. Any message will get you a form-letter response from us, but we will be able to read your message at a later date. So tell us about yourself.

Click the **Send** button in the icon bar near the top.

Send another message to yourself, filling in the **Subject** line with TEST1 and some words in the message body.

Getting new messages

The two messages you just sent will result in two new messages. Wait a minute or two and see if your browser indicates that you have received new messages (watch the screen carefully).
When you want to get new messages (or just see if something new is in), *click* on the **Get Msg** icon.

Reading mail

You should have two new messages. To read them, *click* on the header listing of the one you want to read. The text appears below. You may have to scroll the window to see the whole message.

Reply to a message

With the message to yourself displayed, reply by *clicking* on **Reply** in the icon bar. Note that the original message is copied into the new message window.

Forward a message

If someone sends you a fun e-mail, (there is lots of humor out there in Cyberspace), you can share it with friends with a **forward**. Forward a message to someone (even yourself) by *clicking* on **Forward** in the icon bar. The message is copied to the message box, just like a reply. You can add your own message to this message before you send it.

Heads Up!

A message that is sent to a friend can very easily be forwarded to another friend and eventually may end up being read by all sorts of people. If you have written anything you would not want someone else (a teacher or another student) to read, don't send it via e-mail.

Forwarded or not, e-mail is notoriously not *secure or confidential.*

Include a file in a mail message

If you have a file that you want to send (a graphic image or a word-processed document), you can **attach** it. *Click* on **Attach** (the paper clip is the icon). The menu system that comes up lets you find the file you want to attach.

After you have selected the file (**Open**), it will appear in your message, either as an icon or listed in the header section of your message. Some mail systems will not let you send a large file on e-mail. In any case, you should be sensitive to the burden you place on the e-mail system sending large files (there are better ways to do that, as you will learn later).

Send to a friend

Do you have a friend who is also learning how to use the Internet? Send mail to her (or him) now. If she has the same domain name as yours, you may only have to type her e-mail name.

friend@email_address
or
friend [if her *email_address* is the same as yours]

Try other commands

There are several other useful features in the mail program:

Spell check a message you are sending.
Save a message you received in a folder.
Delete a message.

If you have a printer installed, try to print a message.

Exit mailer

Select from the menu bar **File—Quit** to close Netscape, or **Communicator—Navigator** to switch to the Web browser. You can also click on the close boxes for your window or use the minimizers.

Questions

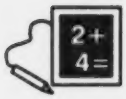
1–1. What organization responded to your test e-mail message?

1–2. Where is the computer that returned your message (city and state)?

1–3. Send another message and this time make an intentional error when you type the e-mail address. What happens?

1–4. What is different about communicating with e-mail rather than person-to-person?

1–5. Is it easy for someone to forward your mail to someone else? What implications does this have?



Browse for Addresses

There isn't a Master Phone Book for the Internet, and it is best to have someone tell you her or his e-mail address. But you can often find someone's address, especially if you know where he or she is in school or work.

Intelligent guessing to find a domain

- All universities domains have .edu at the end. Ususally, the name of the university is easy to guess:
  stanford.edu harvard.edu ucla.edu umn.edu (University of Minnesota)

- All government domains have .gov at the end (except the military, which uses .mil). If you can guess the organization, you can navigate to where you need to be:
  noaa.gov nasa.gov senate.gov whitehouse.gov

- Most public schools are given a domain that follows a pattern like this: *school_district*.k12.*state*.us
  Jane Lopez's school would be (assuming it was Los Angeles Public Schools) **laps.k12.ca.us**.

Browsing the Web site for locators

Type a URL into the Location or URL box at the top. The form of these addresses is http://www.*site.extension*. Try some of the *site.extension* names above; for example **http://www.whitehouse.gov**.

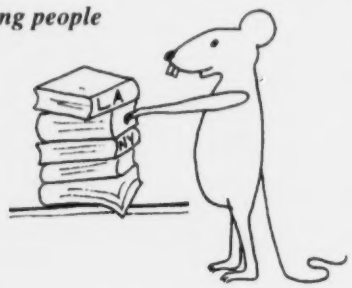
Lots of Web sites have personnel locators, and you can use these for people who work there. If there is no personnel locator, you can usually find someone listed at the organization. You can use that style address to try sending an e-mail to someone there.

Go to the NOAA Website

http://www.noaa.gov

NOAA People Locator
Type the last name of Poppe and *click* on **Find**. Note the style of the address—everyone at NOAA can be reached using the same style: **First.Last@noaa.gov**

Finding people



Finding domain names can be easy if the domain has a Web site that you can find. But people's e-mail names can be anything, including a number!
In recent years, a lot of standardization has occurred. Try these variations if you have a domain name *but don't know the form of the person's* e-mail name*:*

Lopez	jlopez
lopezj	Jane-Lopez
Jane.Lopez	Jane_Lopez

Search engines

Search engines are software that look through Web pages to match a word (or words) that you type in. Some engines will look at every word on every page; some look at indexed words only. You'll be amazed at what some search engines find!

Some of the search engines have specific searches for people. Try to find a friend or a relative.

Click on the **Search** icon in your browser (or type the URLs listed below).

Whatever search engine comes up, see if it has a People locator. At least try these:

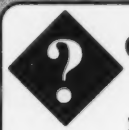
AltaVista	**http://www.altavista.digital.com/**
Excite	**http://www.excite.com/**
Infoseek	**http://www.infoseek.com/**
Lycos	**http://www.lycos.com/**
Netscape Netcenter	**http://www.netscape.com/ (choose among search engines)**
WebCrawler	**http://webcrawler.com/**
Yahoo!	**http://www.yahoo.com/**

Look for your e-mail address, your relatives' addresses and phone numbers, your friends' school e-mail addresses.

You might want to view an online guide for Web searching. Try one of these:

The Spider's Apprentice — **http://www.monash.com/spidap.html**

Power Searching for Anyone — **http://searchenginewatch.internet.com/facts/powersearch.html**



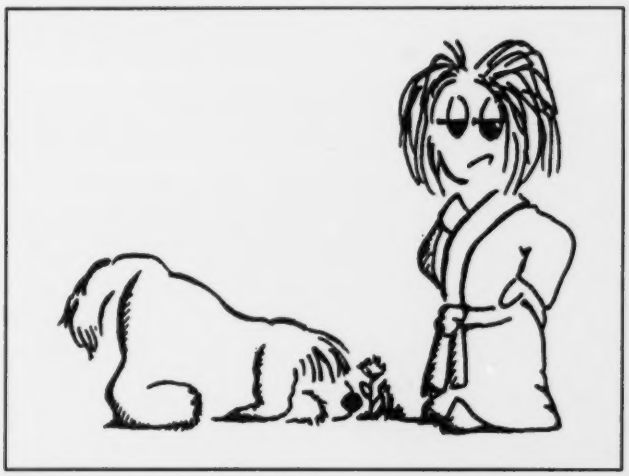
Questions

1–6. How do you think the address and phone numbers are found (where did they come from) ?

1–7. What limitations did you observe in finding e-mail addresses?

Science on the Web

Activity 2
Finding Science on the Web



Several days later, Jane was asleep when the alarm went off and she hit the snooze button for seven more minutes of sleep. She found it was hard getting out of bed so early, but she had to get up to let the family's new puppy out and then play with her before getting ready for school. She was partly awake when she thought she felt the bed sway. It wasn't much, and she had just begun to think about earthquakes when it stopped. Was it an earthquake or just the wind? Well, she had to get up for school.

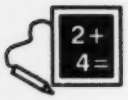
Sandy, the puppy, was thrilled to see her, maybe more than usual. Jane thought she was acting differently and remembered hearing her whimper early this morning. When she went outside, Sandy raced around sniffing at everything. Jane had to wait a long time until Sandy settled down. Jane thought this was interesting, because animals often act differently around the time of an earthquake.

No one in the house or on the bus seemed to know anything about Jane's earthquake. She wasn't imagining it! She thought she'd check out a few facts about earthquakes and find out if there had been one near enough to be felt in her area. She knew bigger ones could be felt farther away. Maybe this one was big and far away, or maybe it was a little one close by.

If there had been a big earthquake far away, the news would probably have reported it; you always heard about the big ones. So Jane decided that it would have to have been a small earthquake that not many people noticed. She wondered if the Web could tell her about recent earthquakes.

Mrs. Fine had recently taught the class about some exciting Web tools that allow "conferencing." This allows two people on the Web to type messages in real time (that is, with no delay) to each other, draw on the same "whiteboard" and point to the same drawing at the same time, even *talk* to each other over the computer microphones and speakers, and if each had a video camera, see each other while they conference.

Jane had planned to look up the earthquake information during her free period, but an e-mail from her uncle required her attention. She really needed to have a conversation with him. Jane decided to use conferencing to "talk" with Uncle Josh. She could look for earthquakes later.



Real-Time Conversations with Conferencing*

Although not installed on all systems, the ability of the Internet to serve as a connection for typing messages, sending voice, and even sending video signals back and forth in real time is not even a thing of the future. It's here now. The only limitation is the necessary equipment, and many schools and others have what they need. The technical expertise to set it all up may be the only obstacle.

Unfortunately, every platform runs a slightly different version of the software, and therefore the instructions below are not literally specific. And this product is not mature—it has bugs in it and doesn't always work the way it should. Nevertheless, a fearless user can learn to use it very quickly. (If it's not set up in your school, perhaps you should figure it out for your teacher!)

Before you begin

You will need two things:

1. Netscape Conference software (can get from the Web and install as instructed).
2. Know your IP address and the IP address of the person you want to call. You can find your IP address from your teacher, or on a Macintosh under the Apple menu, **Control Panels—Network** or **—MacTCP**), on a Windows PC by checking the **Network** control panel (use "Network" for an Ethernet connection; use "Modem" for a dial-in connection), and in UNIX by typing **nslookup** ***computer_name***.

   You might want to check with your school's technology coordinator or networking technician for exact instructions since your Internet connection may be undergoing a change from static to dynamic addressing. If you are using a dial-in connection, check with your Internet Service Provider for your IP address.

Setting up a session

Both computers must be running the conferencing software for a communication to be established. Send e-mail to arrange a time. At the requisite time, then, both people begin Netscape Conference. The timing does not need to be precise. Whenever both computers are running Conferencing, you can begin.

One party then **dials** the other using the IP address. It is possible to use the computer name (not just the e-mail domain name) rather than the IP address, as long as the computer name is listed in the domain's name table. So Jane could find out her uncle is sitting at **smpt.stanford.edu** and use that address.

Talking

When the first person dials, the second person then **answers** the call. Two windows will appear: one for the local and one for the remote caller. You should be able to hear each other talk through your speakers. If you can't, check your hardware (does your computer have a microphone and speakers built in? is it configured right?). Without the video feature, the remote window will have hash in place of a video picture of your caller.

Chatting

A "chat" window lets you type a message that is sent either when you press **enter** or type **<control> enter**. The person at the other end can interrupt with their own message. It's a lot like a phone conversation, only you have to type.

* You may wish to skip this section for now. Just jump to "More Browsing". But try these features sometime.

Note that you may have to delete your conversation (using the trash icon or creating a "new" page and then canceling) or else the next conversation you start will have this text still in it.

Heads Up!

When typing messages for e-mail or chat, save the use of upper case letters for emphasis (such as when you are REALLY EXCITED about something). You can show that a comment is intended to be funny with the symbols

:–)

(turn the page sideways to view).

Drawing

The "Whiteboard" is a paint-type window that lets you draw and point to things while the other person watches and does the same.

Collaborative browsing

This feature allows both people to see the same Web page at the same time. You might like to show someone something you found and talk about aspects of it together.

File transfer

This feature will allow you to send a file to the person with whom you are conferencing. This is not the only way to send a file, but it is a handy tool in communicating.

Video conferencing

You will need at least one video camera to use this feature. With one camera, you can send video signals, but you won't receive signals from someone without a camera.

Composer

One other great feature is the one that lets you design your own Web pages. You can modify an existing page—a good way to begin—or create a new one. The resulting page can't bec seen by the world unless it is moved to a Webserver, but you can bring it up with a browser on your computer. Try making your own page and viewing it. Then ask your administrator or teacher about how others can view it. This is a great way to prepare and submit assigned reports.

Questions

2–1. If you were writing a scientific paper with a friend in another state, how might you use the conferencing tools to help you?

More Browsing

Searches for subjects

Search engines all work in different ways, and even though they are looking at what is on the Web, they return different answers. You will find that one or another works better for what you want. **Mamma** searches using other search engines.

In Netscape Navigator, type in the URL in the "Location" box.
http://www.mamma.com

Some search engines take two words and search for them together; others ask, after the first word search to "qualify" a search with a second word. Some require you to specify on the search that you have two words that need to be sought together. To qualify this kind of search, you need to quote the string. This gives you a more targeted list. If you quote them separately, or list them without quotes, you'll get hits on each word. Know your browser: learn how to ask for to get what you want.

Search for *earthquake*; how many "hits" did you get?

Try using another search engine to find *earthquakes* and compare the finds.

Run a new search for *USGS* and *earthquake*. Does this limit the hits?

"Power Searching for Anyone" provides tables of search engine syntax.
http://searchenginewatch.internet.com/facts/powersearch.html

Heads Up!

Occasionally you will get a pop-up Submit Warning that says "Any information you submit is insecure and could be observed by a third party while in transit."

The largest concern here is if you are submitting sensitive material such as your credit card number. Generally searches do not need to be secure, so you can select "Continue Submittal."

Questions

2–2. Do you find that one search string was better than another?

2–3. Search for a subject that you are interested in using several search engines. Which is better for what you want?

Local Earthquakes

One of the hits you might have found under *earthquakes* is the U.S. Geological Survey. Use their site to find today's earthquakes in California.

http://quake.wr.usgs.gov

Latest Quake Information
California and Nevada

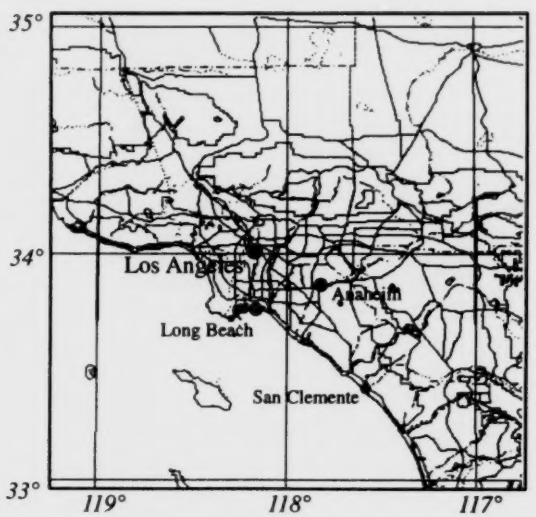
You will want to check the exact location of some of the quakes, so in the text below the map, click on the list of all earthquakes.

Questions

2–4. Find the strongest quake in the last few days in California.

2–5. Check the activity every day for a week. Do the quakes appear randomly or are they clustered throughout the state?

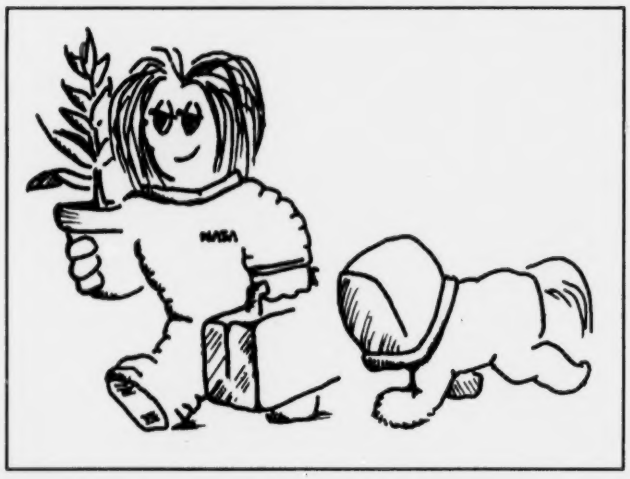
2–6. Jane's latitude and longitude are approximately 34°N, 118°W. Was there a small earthquake near her home today?



We'll look at earthquakes in more detail in Activity 7.

Science on the Web

Activity 3
The Space Shuttle



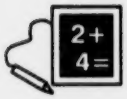
Jane had not told her parents much about her work on the Web. She didn't want to tell them she had been conversing with Uncle Josh because that would lead to other questions. The plans for the party were progressing nicely and so far the secret was safe. But she did tell them that she had been using the Web to find earthquake data and stuff like that.

Her mother liked to hear what Jane was doing in school, and she was curious about the Web. Boy, she'd be excited if she could write (or even *talk*) to her brother in San Francisco using e-mail or conferencing, thought Jane! Her mother was a "family" kind of person, and Jane looked forward to telling her about the Web tools after the party!

Jane's father was also interested in the Web. His small company didn't yet have a connection, but it had a small research contract with NASA for biological research (small for NASA, that is, but very important to Jane's dad). Lately, he had been pretty excited about the project that he had been doing: studying seed germination in a zero-gravity environment. An experiment designed by his company was scheduled to go up with the next NASA space shuttle mission, due to launch soon.

This morning at breakfast, Jane's dad asked her if she could use the Web to find out if the launch was on schedule, and if his company's experiment was included in the shuttle cabin's payload. Wow! People are sure expecting me to find out anything and everything these days, Jane thought. She almost blurted out that she didn't know how to get the information, but since her father seemed so interested and so confident that Jane could do it, she just smiled when he kissed her good-bye and said she'd try.

Still, she grumbled to herself on the way to school that everyone was thinking of her as some kind of expert even though she wasn't. Why me?! Her resentful feelings began to melt away when she got to NASA in a flash. Trouble was, the NASA site is *huge*.



Space Shuttle Missions

Go to the NASA home page.

http://www.nasa.gov

Space Shuttle Launches (in the sidebar)

Questions

3–1. How far in advance are shuttle flights scheduled?

3–2. What orbiter is due to launch next, and how many crew members will there be?

3–3. How many flights has the orbiter ever been on?

3–4. What delays (if any) have occurred in the launch schedule?

Return to the NASA Home page (**Back** should get you there)

Next, click on **Hot Topics** (below the pictures in the middle of the page)
Space Shuttle
Reference
Shuttle Statistics

Check the cargo (or payload) information and schedule. You may need to browse as bit to answer these questions.

Questions

3–1. What experiments will be done in the cabin on the next space shuttle mission?

3–2. What delays (if any) have occurred in the launch schedule?

Connect to Spacelink

It's hard to get around in the NASA site without spending a lot of time (but you can learn a *lot*). Spend whatever time you want, but leave time to look at Spacelink: **http://spacelink.nasa.gov**

Be sure to go to **Hot Topics** on the Spacelink Home Page; you might want to even Bookmark it. To Bookmark a particular Web site, look for the Bookmark menu in your menu bar or below near the icons. Pull down and select **Add**. The browser will read your current URL and add it to your personal set of bookmarks.

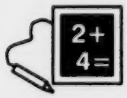
Bookmarks

If you had to refer to the encyclopedia constantly, you might well decide to stick a bookmark in at the pages you refer to a lot.

You can do that with Web pages. When you get to a site that you think is valuable for future referral, select the bookmark option and "Add" a bookmark. Netscape will copy the URL into a personal bookmark file for you to use later. To return, use the same Bookmark option and select the URL from the list. Your browser will load that page immediately.

If you are accessing the Web at a school, bookmarks may not be allowed, may be collective (everybody who uses that computer can save bookmarks in a common file), or may be saved to your personal floppy diskette. You will have to ask how bookmarks are handled in your school.

Jane called her dad at the office and told him the shuttle information. He seemed to be delighted to have the latest news, and he was glad to see that his work was going to be a part of the space shuttle flight. He certainly had talked a lot—every night at dinner—about his experiment and what he might discover. By now, even Jane was getting interested in the idea of being weightless. She wondered what it might be like to live in an environment without gravity. She decided to use her computer to look up library books about weightlessness. Making the connection to the library was easy: Mrs. Fine had used a computer class to look up some books at the Los Angeles Public Library, and the Web address was still on the board in the classroom.



Library Systems

There are hundreds of library systems connected to the Web, and many are linked together. If you can get into one system, you can often "hop" from system to system to find what you want.

One good source for the Western U.S. states is the Colorado Alliance Research Libraries Corporation home page. There are nearly 40 CARL System Libraries as of this writing.

http://www.carl.org

Our Library Partners Can you find your library there?
Los Angeles Public Library.

Search on **weightless** and **weightlessness** and sift through the list to find a non-fiction book that deals with the subject of weightlessness.

Intelligent Searches

An Infoseek Search on the word library *yielded over 3.5 million "hits."*

A search on public library *yielded over 5 million hits (all with library* and *all with public).*

A search on "public library" *(in quotes) yielded about 150,000 hits.*

A search on library, *followed by a secondary search within the first 3.5 million pages on* public *yielded 4,600 hits.*

Get to know your search engines. They all work a little differently, and it makes a BIG difference.

Questions

3–3. List the title of a book at the Los Angeles Public Library that is about experiencing weightlessness on the space shuttle.

3–4. What information would you need to copy down in order to find the book when you go to the library?

3–5. Find a story by Isaac Asimov about being weightless.

Science on the Web

Activity 4
Weather and Climate

Friday! Tomorrow, Jane and some friends are going to the beach or to the desert. So far, they can't decide where they will go. Jane offered to check out the weather because they don't want to go swimming if it is too cold, or to the desert if it is too hot. If it is cold on the beach and hot in the desert, they would just hang out at the mall. Living in the hills as she did, Jane was often surprised to see that the weather just a few miles away could be so different from that at home.

The radio weather man had said tomorrow's weather would be "more of the same." She decided to try to find out the temperature today in San Diego and in Palm Springs.

Jane tried to get Mrs. Fine to help her, but she was out of the building that day. It wasn't until the end of the day that Jane ran into Mr. Goodman. He was a parent who volunteered in the computer lab, and he knew a lot about the Web. After school, Jane sat down with Mr. Goodman and learned how she could find the answers to her questions.

The Web is loaded with weather data, but finding it in a form that is usable is laborious. Mr. Goodman seemed to be enjoying the many weather pages, and pretty soon Jane thought this might turn into a week-long project instead of a 5-minute query. But she saw that if she focused on one set of pages, she could settle the weather question that would decide where they would go tomorrow. Still, it was Friday afternoon and Jane wanted to be done with "school" for the week. She thanked Mr. Goodman, and went to an open computer.

Finding Local Weather Conditions

There are lots of places on the Web with weather data, and you might find one that you like particularly. If so, bookmark it. But to get you started, go to the National Weather Service home page.

http://www.nws.noaa.gov

There are lots of interesting pages here to explore.

To get to the temperatures, jump to the regional NWS office information. You need to move to a different NWS site.

http://iwin.nws.noaa.gov

Graphics version
Local Weather

Point to the map and click on **California**
Point to the map and click on **San Diego** and read the temperature, wind, and sky conditions.
Go back and click on **Palm Springs**; read the temperature, wind, and sky conditions.

Questions

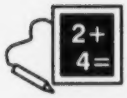
4–1. What is the weather like in San Francisco today?

4–2. Jane had to call her friends that night to tell them what the weather was going to be and where they were going tomorrow. Her choices could be diagrammed as shown.

What did they decide to do based on today's weather in San Diego and in Palm Springs?

For a commercial site that gives weather, try **http://www.intellicast.com**.

Jane was satisfied with her weather search, but you can hardly hear about the weather these days without hearing about El Niño. She decided to spend a few minutes reading about the "El Niño Southern Oscillation." And while she was at it, she thought she'd look at what, besides a lot of rain, might happen with a climate change.



Researching El Niño

El Niño is a large-scale effect that lasts for months, if not years. Weather reflects the impact of climate. So let's go to the Climate and Diagnostics Center of NOAA.

http://www.cdc.noaa.gov

General ENSO Information
What Happens during an El Niño?
Check out the 3-D animation and read the description about El Niño.

Look at some weather maps

While you're at CDC, take a look at some actual weather data. You can begin to see the complexity of what is behind a simple weather forecast of "sunny and mild."

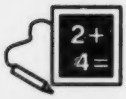
From the CDC home page, look at the Map Room

Weather Products
Current Weather Plots

Questions

4–3. What is the difference between weather and climate? (Look at Background at the CDC site.)

4–4. What causes El Niño? Is the condition good or bad?



Locating Icebergs

One phenomenon that, like weather, changes daily, but also, like climate, has a long-term pattern of change is the creation and location of icebergs. The Titanic showed us why it is important to know where icebergs are located.

Since 1900, The U.S. Coast Guard has conducted a count of icebergs month by month. Look at their Internal Ice Patrol home page.

http://www.rdc.uscg.mil/iippages

Data
International Ice Patrol Iceberg Count Data

Look at the data listing for the various months and years.

Questions

4–5. Compute some 5-year averages of total number, starting with 1997 and going back. Which 5 years have the highest number or icebergs?

4–6. In general which months have the highest numbers of icebergs? Why?

4–7. What long-term effects might we expect on icebergs if our climate changes?

Tracking an iceberg

In 1983, the U.S. Coast Guard placed radio beacons on several icebergs to track their movement in the ocean. The beacons were monitored by satellites overhead. One of the icebergs was called "02625.ndc," after the radio beacon that was used. You can track this buoy by visiting the **ftp** site with your browser.

Go **Back** to the IIP home page (**http://www.rdc.uscg.mil/iippages**)

Data
International Ice Patrol Iceberg Data Buoys
ftp site
02625.ndc

This is a sample of the data. You can find an explanation of the fields at the **ftp** site, but we have delineated it for you below.

Available at Space Environment Center
http://www.sec.noaa.gov/Activities

156	C02625533336N0544424W8303242255000	0001
156	C02625532512N0545135W8303260715000	0002
156	C02625532100N0545100W8303261222000	0003
156	C02625530112N0545024W8303270701000	0004
156	C02625524836N0544424W8303271515000	0005
156	C02625524836N0544424W8303271832000	0006
156	C02625524424N0544123W8303280834000	0007
156	C02625524424N0544123W8303281133000	0008
156	C02625525547N0542547W8304011141000	0009

156 C02625525547N0542547W8304011141000 0009

Buoy no. | Latitude DD | MM | SS | North | Longitude DDD | MM | SS | West | Date YY | MM | DD | Time HH | MM | Observation No.

Questions

4–8. Where in the world was the "02625" iceberg? Plot its initial location on a graph.

4–9. On the graph, plot the path of the berg while it was under observation.

4–10. Determine the approximate fastest speed of the berg in knots.

Science on the Web

Activity 5
Finding Programs

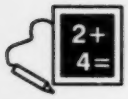
Saturday with her friends was really fun, Jane thought; they hadn't wanted to come home. But Sunday, which was supposed to be relaxing was far too busy. She had too much homework, she had to help bathe the puppy (actually, that was fun, although Jane got soaked too), and she had to do other chores and clean up her room. When did she get any time for herself? Monday had come too soon.

For a Monday, though, this was turning out to be pretty good. So far, none of her classes had assigned homework, and she was beginning to think that a few easy evenings might make up for the busy weekend.

Her computer class was usually pretty loose, with each student doing something independently. She had been hearing people say "oh, you can get that program on the Web," but she hadn't seen *any* programs. She wanted to find out where those programs were.

Today she had time to explore. Mrs. Fine was back in class, so Jane asked her where to start. With **archie** said Mrs. Fine. "Archie?" (Where do they get these names, thought Jane.) Mrs. Fine didn't have much time for Jane that day, and went off to help someone else, but she showed her where to find **archie**, and that was all Jane needed. She found out that **archie** is a tool that can be used to find programs at **anonymous ftp*** sites using a Web browser. She wanted to get some "shareware" programs for her best friend to run on her Macintosh at home, and Richard had been bugging her about bringing home some games. If Jane could get these free programs from the Web, she could help her friend use her home computer and could learn the new game, before Richard became the resident expert.

***FTP** "file transfer protocol," is a way to copy a file from one computer to another. **Anonymous** means you don't have to have a login on the computer. Everyone is permitted to login as "anonymous."



Running games on the Web

There are lots of games on the Web, and you should try to find some. Quite a few are at this site:

http://zippy.sonoma.edu/kendrick/games

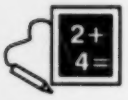
Choose several games and run them. Are they fun? Are they slow?

Some games work well on the Web, but not fast-moving ones. You need to consider getting a game that actually executes on your computer. That will allow the game to run faster because it doesn't have to connect to the Internet—the greatest slow-down.

You can use the Web to preview a game you might like to buy. There are lots of commercial sites like this. Try one of these:

http://www.jumbo.com
http://www.sierra.com

At these sites, you will be able to download a program that will execute on your computer. Click on the link, and check where it is going to be placed. Look at the table of how long it takes to download a file; you may not be willing to wait an hour to get it. You may also encounter some problems with compressed files. Read on to learn about *unzip*.



Getting a game

Running programs on the Web is slow; buying games is expensive; running demos is time consuming and ultimately unsatisfying. There are some other alternatives.

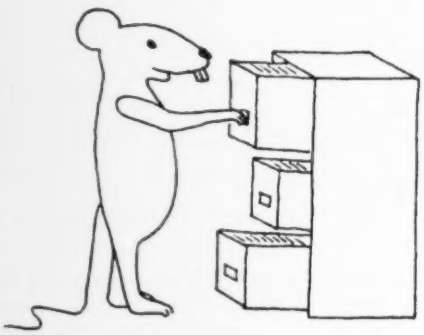
One alternative is software called "shareware" because you can get it for no cost, although they ask you to pay a little if you use it. This is a great site to find shareware programs:

http://shareware.com

You can search for topics at this site as with any search.

Try to download a game to your computer.

Where did that file go?



Sometimes the hardest part of working with computers is finding where stuff is.

If you request a file to be downloaded to your computer a menu will appear that allows you to control the destination of files that you get. After the file is transferred, you'll find it in the destination directory.

If you fail to select a directory, or forget the default, try asking for another download, only this time check the default directory and then cancel the download. Searching for a file on your computer is possible, too, so remember what you called it.

Questions

5–1. Describe a game that you have tried. What is the game's best characteristic? What are the biggest problems with it?

Using archie to find programs

You can see the advantage of having a program run on your computer. You may also realize that Web sites don't point to everything on the Internet.

The program **archie** allows you to search **ftp** sites on the Internet for file and directories names containing a string of characters that you specify. This is a little different from the search engines that find text strings in Web pages. The results of your search will be a list of file names of executable programs that don't "look like anything." You will have to select them by their names and install them to see how they play.

There are many **archie** servers, and if one seems to be very slow, you can try another. You can use a search engine to look for **archie**. One very good site is at Rutgers University.

http://archie.rutgers.edu

Try looking for the program *"netscape"* and see what kind of listing you get back. Just as with a search engine, the listing you get back can be large.

A program for the PC

A useful tool to have when you are downloading files to a Windows-based computer is **unzip**. This program is needed when a file has been "zipped" so as to compress it and sometimes to group items.

Search for *unzip*.

Click on one of the listings that contains *UNZIP.EXE*. The "EXE" ending means it's an "executable," a program. You should then get a window that lets you select where to put the file and what to call it. You will have to learn how to use the program when you get a "zipped" file, but that should be fairly straight forward.

A program for the Mac

A similar program to the PC *unzip* is **stuffit-expander**for the Macintosh. This program should be bundled with your browser, but if it isn't, installing it on the Mac will allow Netscape to use it automatically.

Search for *stuffit* or *stuffit-expander*.

Click on one of the listings to download. You should then get a window that lets you select where to put the file and what to call it. You will have to learn how to use the program when you get a "compressed" file that your browser cannot open. However, just having the software on your computer may be all that the browser needs to open the file for you.

Questions

5–2. Which version of **unzip** or **stuffit-expander** did you select?

5–3. Use **archie** to locate a "paint" program for your computer. Which Internet computer has such a program? What is the directory and file name?

Archie can point you at some specific programs, but it is fun to actually look at a list of games that you can choose from. There are some good ftp sites with lots of programs. Try some of these; they can all be called up with your Web browser. Just type these into the URL (Location) line.

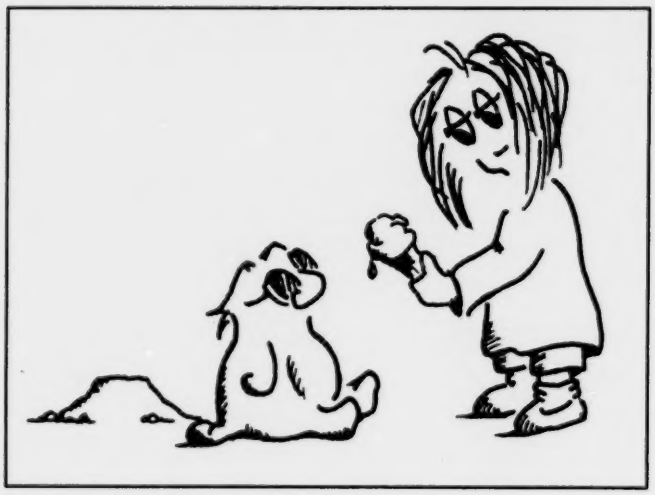
University of Texas Mac archive—**http://wwwhost.ots.utexas.edu/mac/main.html**
University of Texas Mac archive ftp equivalent—**ftp://ftp.utexas.edu/pub/mac/**
ftp server at Dartmouth—**ftp://ftp.dartmouth.edu/pub/software/**
Apple ftp site—**ftp://ftp.apple.com/**
NCSA ftp site—**ftp://ftp.ncsa.uiuc.edu/**
Washington Univ., St. Louis, ftp site—**ftp://wuarchive.wustl.edu/**

Heads Up!

There are games that can be played on the Net, but be careful that they are played only during allowed hours. There are also pornographic materials on the Net. Accessing or transmitting these is ***illegal****. You are responsible for your use of the Net, and you can find yourself in trouble for inappropriate use. You should have a copy of your school's policy for use of the Internet.*

Science on the Web

Activity 6
The Sun



Jane's class was planning a picnic at a park quite a ways from the school. They had earned this outing by turning in what their teacher, Mr. Schultz, said were excellent projects (and all of them in on time!). That must have been a first, because Mr. Schultz was not one to take a day off from class! There were teams working on different parts of the picnic: the food, the transportation, the activities, the music (that was Jane's team); and each team was supposed to do more than just decide things. Mr. Schultz expected his students to research everything and give a report to the class. Think of the poor team that had to research the food, thought Jane! Of course, this couldn't be just a day off. But, hey, at least the day would be fun when it came.

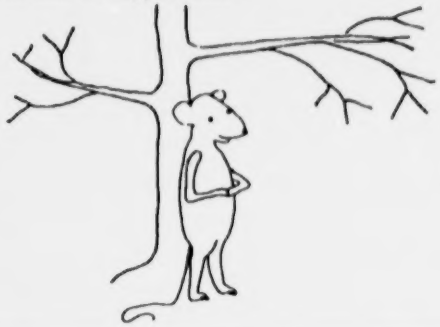
Jane's team knew they had an important project. Her classmates knew music, and they practically lived and breathed the rhythms of the latest hits. They debated whether they could use the radio or should take a boom box and tapes instead. The radio would be most convenient, but they didn't know how the radio reception would be so far out of town. Elvis Jones was on Jane's team, too. He seemed to know a lot about radio. He was a "ham" (in more ways than one, thought Jane). He operated his radio almost every night, talking to people from all over the world. He said he had talked to someone who lived near the park recently; he'd call him and ask about the radio reception.

Boy, this was going to be an easy project. Elvis would do the research and they would be done with it. The next day, Elvis had found out about the reception: it depended on the Sun and what had happened 1.5×10^8 km away! Sunspots can affect radio communications. To decide if the radio would work, they would have to find out what the Sun was doing. Apparently, Jane was going to be doing some research, too, but she knew the Web would be able to give her some information in a hurry.

Mr. Shultz suggested using a browser to look at gopher sites, whatever they were. Jane thought this was going to be hard, but Mr. Shultz used Netscape to get into lists of data types and files. This much data couldn't be displayed in a Web page, and you couldn't possibly wait while loading every image. The file lists allow you to select the image or data you want.

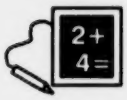
Available at Space Environment Center
http://www.sec.noaa.gov/Activities

Hierarchical vs. Hyperlinked



A hierarchical file structure is like a branching tree. You find the file you want by selecting a directory and subdirectories until you get to what you need. Gopher sites are hierarchical.

Most of what you see is on the Web looks hierarchical, but the pages are really hyperlinked. Hyperlinks let you jump from one place to another: take a jump from limb to limb, and not have to go up and down the tree.



Find a gopher site

The **gopher** software was designed to show you a menu of directories to make looking for files easier. The **gopher** servers are used less and less as the Web has grown. But Web browsers do fine looking at **gopher** sites, and you will want to have access to the files at a **gopher** site.

In order to find an entry in a **gopher** site, you need to use a special search engine. You can use the Web search engines to get to the **gopher** search program **veronica.** The resulting list can then be accessed with your Web browser to open the site.

In your search engine, type **veronica**. Get one that searches Gopherspace (not someone named Veronica's home page). The first one on my list was at the University of Nevada, Reno.

http://veronica.scs.unr.edu/veronica.html

Bring up one of their servers and request "solar images."

Look at a sunspot

Take a look at a sunspot, not by looking at the Sun, but at a photographic image. If you haven't found a site with solar images from your search above, you can go to the Space Environment Center's **gopher** pages. Start at their home page.

http://www.sec.noaa.gov

Data Directories

Note the URL listed for this site. You could have gotten to it by typing **gopher://sec.noaa.gov**

On the Gopher Menu pages, you see a list of directories and files. You navigate them much as you would a file system on your computer. *Click* on the directory to which you wish to move or on the file you want to view.

Solar Images in GIF format
Look at images, both large scale and full disk, in March 98 or current files
White Light and H–alpha images are going to be the most useful to you.

White Light images are what you would see if you could look directly at the Sun. (Remember, staring directly at the sun will cause permanent damage to your retina.) All colors of light make up "white light," that you normally see. Galileo

observed sunspots on the Sun in white light in 1630, thus showing that the Sun was not "perfect." For this and other heresies he was put under house arrest for the rest of his life.

What you see in an H-alpha image, taken with a filter that only allows the light emitted by the alpha state of Hydrogen. That wavelength reveals a lot about the surface temperatures of the Sun. Sunspots are "cool" compared to the rest of the surface, but if you could pluck one off the Sun and hold it in the sky, it would burn almost as brightly as the Sun.

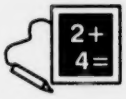
Return to the SEC home page (using **Back** several times or the address above) and read about sunspots.

Explanation and Information
Primer on the Space Environment

Questions

6–1. What do sunspots look like?

6–2. In how many ways does the solar disk that we see in the sky vary?



Finding sunspot data

Images aren't enough to tell you about sunspots. You need to be a trained observer to find all the spots. Go to the National Geophysical Data Center home page

http://www.ngdc.noaa.gov

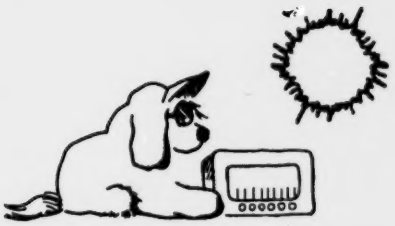
Solar-Terrestrial Physics
On-Line Data (SPIDR)
Solar Information (in the text below the heading)
Solar and Interplanetary Phenomena
Sunspot Numbers

Enlarge the plots so you can read the plot axes.

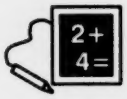
Questions

6–3. How many years of data are available? Which recent year had a high count? a low count? How many years passed between the last two peaks?

6–4. What is it that Wolf discovered (shown in the plots)?



Elvis was pretty thrilled with this sunspot data. This would help explain a lot about his ham radio operation, and he couldn't wait to understand it all and tell all his friends about it on the air waves that evening. But the sunspot cycle only told him what "season" it was and wouldn't really tell him anything about today's "solar weather." Jane thought finding the solar weather was a pretty esoteric request, but she agreed to keep looking for information and kept her doubts to herself. To her amazement, she found exactly what Elvis wanted. When she nonchalantly handed him a printout of the "High Frequency Radio Propagation Report," he couldn't hide his astonishment.



Get the High Frequency Radio Report

Go to the home page of the IPS Radio and Space Services, Australia, site (note the .au on the end of the address):

http://www.ips.gov.au

Current IPS Solar Terrestrial Report

Scroll down on the page to Space Weather Status Panel. Note that green means OK, red means warning or alert. How do the conditions look for HF propagation conditions and real-time ionospheric conditions in North America?

Support for HF Radio in North America
Real-Time HAP Charts
San Francisco

Print the map on this page. Try to find out what it means, using the descriptions at this Website.

Heads Up!

Internet addresses indicate sites that are outside the U.S. Australia addresses end in ***.au****, Japan addresses,* ***.jp****. It's fun to inspect addresses and realize that you are online with France or Russia. Check out* Country Extension Abbreviations at **http://www.bendigo.net.au/general/country.html**

Be aware that you can get to anywhere in the world as easily as any other. But transfer files from the closer site if you have a choice.

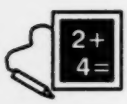
Questions

6–5. Based on the information about conditions, what should Elvis recommend doing about the music?

6–6. If you know anyone who is a ham radio expert, ask them to help you calculate a frequency prediction using the On-Line HF Prediction (at **http://www.ips.gov.au/asfc/usa_hf**). Is this of use to them?

It was getting on toward 5:00 PM, and Jane wanted to be home. But she kept wanting to do "just one more thing." Richard was always so impressed by astronomical happenings. She thought it would be really neat to bring home for him some Sun pictures—printed right there on her local printer. She called home and said she'd be a little late. She promised to be there by dinner time, and asked Richard to kiss the puppy for her. ("Right!" Richard had said, sarcastically.)

In May of 1994, an annular eclipse of the Sun was visible in North America. An annular eclipse is one where the moon doesn't quite cover the Sun, leaving a thin, bright "annulus" or ring. There are views of this event from several different locations in the country. Then there was a total eclipse of the Sun in February 1998 was viewed in near-real time in several places on the Web. She'd take a look at those pictures and note where she could watch during the next eclipse.



Eclipse Pictures

Pictures of the annular eclipse

Go to the **ftp** site at the National Geophysical Data Center.

ftp://ftp.ngdc.noaa.gov

> STP
> ECLIPSE
>
> Open read_me.txt to find our what the images in this directory are about.
>
> *Click* on boulder.mpg if you have a movie viewer installed.
> *Click* on boulder.avi if you don't have the movie viewer.

Look at the other files in this directory so you can answer the questions below.

Now download the **gif** images **ec_bou1.gif** and **ec_holo.gif**.* Import the gif files into a word processor or other program, and print them to your printer.

This exercise could have been a bit easier; the pictures are now on a Web site. It's important to know how to transfer files from an **ftp** site. Just for fun, see what the Web pages look like at **http://www.ngdc.noaa.gov/stp**

*GIF stands for Graphics Interchange Format. The Web uses GIF images a lot, and browsers are good at looking at them.

Pictures of the total eclipse

The total eclipse of the sun that occurred in February 1998 was observed in real time on the Web, despite its having occurred in the Carribean. One site that carried the event was Rice University's.

http://space.rice.edu

Solar Eclipse 98

Select several of the images to look at. You can see that there are descriptive names for the images. To what do they refer?

Questions

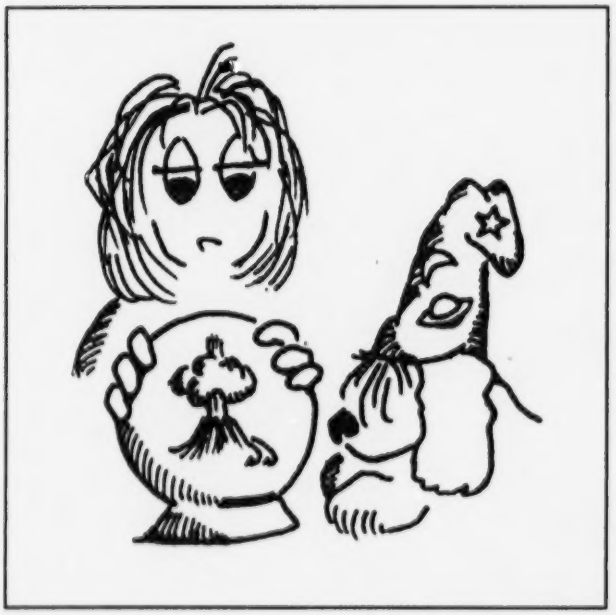
6–7. How are the two views of the 1994 annular eclipse (from Boulder and from Holoman) different? Where were the photographs made?

6–8. Find a map of the path of the eclipse. What part of the United States saw the annular eclipse?

6–9. How was the eclipse of 1994 different from 1998?

Science on the Web

Activity 7
Hazards



Jane's Mom and Dad were thrilled with the 25th Anniversary party. It went off without a hitch. Uncle Josh and Aunt Marcee came down from San Francisco for the weekend, and lots of friends and relatives from around home came too. Richard was happy to have some cousins his age there, and they went off to the basement to play on the computer. He just about missed the whole party, but that was OK. Sandy had an accident on the floor, but Jane cleaned it up right away so Mom wouldn't get upset. Jane had really done a great job making the day wonderful.

As good as the party was, the big surprise of the day came when Jane's father said that he had been asked by his company to move. They hadn't said he *had* to, but had offered him five places to consider: Seattle, Washington; Long Island, New York; Tampa Bay, Florida; Tokyo, Japan; and Sydney, Australia.

Wow. Those were big changes! Jane immediately thought of her friends and her life in L.A. She didn't want to move. Neither did Richard. Her dad reminded them that he didn't *have* to move, at least not yet, but that they ought to start thinking about it.

Late that night, after the party, Jane was haunted by thoughts she had had as a young child, fears of natural hazards like lightning, earthquakes, and floods. It seemed that those fears were always associated with losing the family, and she felt a little bit afraid now. She decided to try to be more adult; that helped her get hold of herself and resolve to do a hazards study for her father. He ought to know about these cities where they might move. With that plan in mind, she fell asleep right away.

In school the next day, she looked for Mr. Goodman to help her with this project. It was a big study, now that she thought of it, and she wanted someone who really liked big, detailed projects to help her. He was delighted at the challenge. Jane and Mr. Goodman began to search the Internet for information on hazards all over the world.

Where do earthquakes happen?

NOAA's National Geophysical Data Center (NGDC) has lots of data, and they let you search their database for earthquakes and volcanoes. There are even photographs of hazards.

http://www.ngdc.noaa.gov

Solid Earth Geophysics
Natural Hazards
Significant Earthquakes

The top part of the form will allow you to restrict the search to a certain part of the world. For your first search, leave the search open to the world (don't select anything in this section), but select the most severe earthquakes:

select **MANY DEATHS** and **EXTREME >$25 MILLION** in damage.
*Click on Search Database

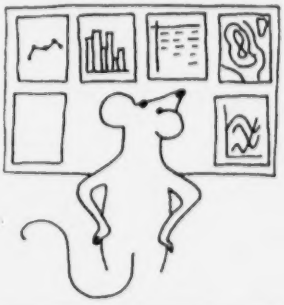
Look on a map and see where these most severe earthquakes occur. Play around with searches varying all the parameters.

Questions

7–1. Where are the four most active seismic regions in the world?

7–2. Where is the most likely place to have a very deep epicenter?

Analysis



One of the great things about digital data is that computers can manipulate them. A table of numbers in a book is just that. A table of numbers in a computer can become a plot, a graph, or a chart with very little effort. This is often how scientific analysis is done—by displaying data in different ways.

So getting the data to your computer and displaying them is very important.

Grabbing data

When you get a list of the larger earthquakes (say magnitude 8 and above), select the data with your mouse (highlight the data as you drag the mouse downward).

When the data are selected, copy the data (**Edit—Copy**).

Move outside your browser and create a new document (a "text" document from a word processing application already on your computer). **Paste** into that document. The data should appear as they were on the browser screen.

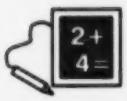
Do a similar search for volcanoes choosing the general regions (North America, Japan, etc.). Grab the data as you did with earthquakes and save to a file.

Large files

With more than one window open, you can move information from one application to another or check on information in other areas. You can run more than one browser at a time, too, in case you'd like to keep one page up while looking at other pages.

Keep in mind, though, that if you open other applications, and especially other browsers, that you can crash your computer if you run out of memory. And the more applications running, the more memory you use.

Jane now had all the information she needed about earthquakes and volcanoes, but she wasn't at all clear about what it meant. She needed to do the analysis of the data, something her science teacher always seemed to be going on about. This time, she wanted to do this analysis, because it was so important to her family and to herself. By selecting large earthquakes and plotting them, along with volcano locations, Jane was able to see where the really dangerous areas were located. With a map of the cities, she could factor in the chance of an off-shore earthquake causing a tsunami (tidal wave).



Plotting Data

Now that you have the data, you need to analyze them. Working with data is made much easier with tools that plot, graph and sort data. Try to "import" these data into a spreadsheet or plot program so that you can do some analysis. Plot epicenters on a latitude/longitude plot at the same scale as a world map so you can overlay the data on the map. You can also plot some of these by hand directly on a map. Plot the volcano data on the same map in a different color or symbol.

Questions

7–3. Why do there appear to be so many quakes in recent years?

7–4. What was the magnitude of the strongest earthquake in the database?

7–5. Do volcanoes occur in places where earthquakes occur? Why or why not?

7–6. Can you make a reasonable estimate of these risks for Seattle, Washington; Long Island, New York; Tampa Bay, Florida; Tokyo, Japan; and Sydney, Australia, based on your observations?

Plate tectonics

You know from Activity 2 that the U.S. Geological Survey runs the National Earthquake Information Center. Let's see what else they have on the Web site.

http://wwwneic.cr.usgs.gov

General Earthquake Information
Plate Tectonics

Print a copy of the map showing the plates.

Questions

7–7. How do the plate boundaries relate to your map of epicenters?

7–8. Are plate tectonics and earthquake occurrence related?

Earthquakes appear in particular places, but Jane didn't see some of the largest earthquakes in her listing of "many deaths" and "exteme" economic losses. Why? Large earthquakes can be very destructive and cause death and economic disaster, but some large earthquakes cause little damage. She could see that deadly mix was seismic activity *and* human occupation. The most damage and death will occur where there are people and development. She decided to look at one more piece of data before calling it quits.

Damage and Deaths

One quick way to see development and high-population centers is at night in the dark. A satellite photo is worth a thousand words.

Go back to the SPIDR site (did you bookmark it?).

http://www.ngdc.noaa.gov:8080

Click on City Lights

You can *click* on any of the black maps to enlarge them.

Questions

7–9. Pick out New York, Dallas, Denver, Los Angeles, your home town on the City Lights maps.

7–10. How well do the lights correlate with the heavily damaged earthquake sites?

7–11. A very large earthquake occurred in China in the 20th century. When did the quake occur (year, month, day)? How many people died? Locate it on the City Lights map.

Heads Up!

When you are browsing and get an error, first check your URL. Did you type it exactly right? If you are using a hyperlink and find an error, you can help the developer by reporting problems and ideas that you have. You'll often find an e-mail address at the bottom of the Web page to which you can report problems.

At almost every site, you can e-mail to webmaster@*URL (for instance, webmaster@www.sec.noaa.gov).*

Be careful when you state your problem. It just might *be your problem, not theirs.*

Science on the Web

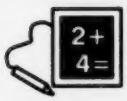
Activity 8
The Winds

Jane had presented her findings to her father. He was quiet a long time, looking over the data she had given him and thinking about his concerned, bright daughter. He was deeply moved by her thoughtful considerations, troubled by her obvious concerns, and impressed by her ability to do such excellent research. When he asked her what her conclusions were, she was quick to list the pros and cons of each city. Her dad thanked her for the information and promised to talk about it with her mother.

Within a week, everything had changed. Her dad's company was not going to move him anywhere, but her parents were still thinking about making a big change in lifestyle. Jane couldn't understand it, but this move sounded better. They might just move a few miles away or a few hours away. She could still see her friends, at least sometimes.

But the surprises weren't over. Jane's parents seemed awfully restless, if that's what you could call it. First they were thinking of Tokyo, and now a trip East to see family. They all hadn't flown across the country in about 5 years, and now they were going to in a matter of days.

Richard had already started whining about the trip and how long it would take to get there. Printed on the the tickets were the departure and landing time, so he knew how long the trip should take. But his father reminded him that if they had a good tail wind, the flight could be shorter. Richard was intrigued by that. He asked Jane to find out about the winds. Oh sure, she thought, and put it out of her mind. She started packing the night before, because there wouldn't be much time after school before they left. She thought she'd need clothes for cool weather, then changed her mind, then changed again. She wished she knew what to do. Then she realized she could get weather information on the Internet during second period. And while she was at it, she might just check the winds for Richard.



Checking Weather

A huge weather data site is at Purdue University. We can look at lots of types of data here, but let's start by looking at elevations across the U.S.

http://wxp.atms.purdue.edu

USGS Maps

Look at the elevation map on this page. *Click* on your area of the country and see what elevation changes you can recognize near your home. Check mountainous areas of the country and see how they differ from the plains areas.

Go **Back** or to Main
Surface Map
Contour Plots
North America Temperature Countour

The contour map of North America lets you see the temperature of Florida as well as the northernmost part of Alaska. How big a range of temperaures is shown today?

Go back to the Surface Data page. Look at the Composite Map Plot. You can see regional maps like these for where you live.

Regional Data Plots
Southwestern US Data Plot You should be able to pick out L.A.
Mid Atlantic Data Plot You can see Long Island at the top of the map.

So what do the funny flag-like symbols and the numbers mean? To read surface weather maps you need a little more information.

Details For More Information
Info Surface Data Plot Read what the symbols mean.

Go **Back** and look at some regional plots, now that you know what the symbols mean.

Questions

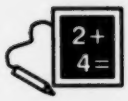
8–1. What are the temperatures in Los Angeles and in Washington, D.C., today?

8–2. What is the wind direction and speed in each city?

8–3. What is the sky cover in each city?

8–4. What is the barometric pressure in millibars in each city? (*Hint*: on surface maps "987" means 998.7 millibars; "183" means 1018.3 millibars.)

Available at Space Environment Center
http://www.sec.noaa.gov/Activities



Going to 30,000 feet

Now let's look at the Upper Air! In the Purdue University WXP home page (Main)

Upper Air
Details For More Information
Be sure you know how to read these maps. They are like the surface ones, so just scan this information to answer the questions below.

Questions

8–5. How are the Upper Air data obtained?

8–6. How often are measurements made?

8–7. What is the approximate barometric pressure at 30,000 feet?

8–8. How are the weather symbols used on the Upper Air maps? (Although the symbols used are identical, there are differences in how they are used on Surface Maps and on Upper Air Maps.)

You are now ready to look at the maps for 30,000 feet.

Go **Back** to the Upper Air Data
Constant Height Plots
300 mb Map
You'll see a weather map that looks a lot like the surface map, only there are fewer data points (can you guess why?).

Questions

8–9. Draw an imaginary line between Los Angeles and Washington on the 300 mb map. What wind directions and speeds do you find for stations on or near the flight path?

8–10. What is the prevailing (typical) direction at 30,000 feet? Will the wind help or hinder an aircraft flying from Los Angeles to Washington?

8–11. What will be the temperature of the air outside the aircraft at 30,000 feet?

8–12. What time were the 300 mb wind-speed contour data taken?

8–13. On the 300 mb map, how does the speed in knots vary over the path from L.A. to Washington?

8–14. What is the fastest wind speed (in knots) that will be encountered on the flight? What is the fastest wind speed in miles per hour?

Science on the Web

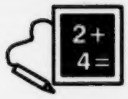
Activity 9
Greenhouse Gases

The semester was finishing up for Jane. She was just a little bit sorry, because she had really liked her teachers and her classes. Still, finals and term papers had yet to be done, and she wished *those* were over. She had to do a term paper about the use of the Web, but by this time she was pretty knowledgeable about what was on the Web and how to use a browser to get to those resources.

What worried Jane more was her science project, involving the study of "greenhouse gases" and how they affect global warming. That was taking a lot more time than she had planned. Although she thought she could find the information, she wasn't sure what to do with it. She was required to get actual data and do an analysis. That would be hard, she thought. She *had* done some data analysis with her Hazards study. She knew that plots and graphs can help to "see" what the data are saying. Then Mr. Goodman gave her some questions to answer that structured her research.

Still, Jane knew almost nothing about greenhouse gases. She decided to start at the Environmental Research Laboratories of NOAA.

Available at Space Environment Center
http://www.sec.noaa.gov/Activities



Background on Greenhouse Gases

The Aeronomy Laboratory, of NOAA Environmental Research Laboratories, studies greenhouse gases extensively.

http://www.erl.noaa.gov

AL Aeronomy Laboratory
Greenhouse Warming (under "The Environmental Issues") — Read about the importance of this issue. (It is short enough to print out.)
Stratospheric ozone — Notice the plot about what thinner ozone means.

Questions

9–1. What are the greenhouse gases?

9–2. What are their properties?

Look at Ozone

Return to the NOAA Environmental Research Laboratories home page (**www.erl.noaa.gov**)

CMDL Climate Monitoring and Diagnostics Laboratory.
South Pole Ozone Profiles.
Select an Ozone Profile (by date).
Request Ozone Profile.

Questions

9–3. Look at several ozone plots. Do they all look the same?

9–4. What do the two profile lines show?

Downloading CO_2 Data

Ozone seems to go up and down every year. How can you see trends in variable data? You can compare highs and lows from year to year. You can also look at other factors. Let's look at the concentration of CO_2 as it varies over the years.

Return to the CMDL home page.

Data available by anonymous ftp —You will be getting files from an **ftp** site and navigating directories as you did with **gopher**.

Carbon Monoxide, Carbon Dioxide, and Methane
co2

flask
README

You will see a long text file. What are the "Warnings" at the beginning about? This file will tell you all about the data. You won't need to remember all of this. The files you will get are easy to read. But note the station names and codes where the measurements were taken. As an example, we'll be using **spo** (South Pole Scott–Amundson Station) data. You will want to remember a few more stations' IDs.

month
spomm.co2

Look at the data in this file (station code, year, month, concentrations of CO_2 in parts per million).

Save these data by selecting **File—Save As**. Check the default directory in your pop–up menu, check the filename that will be used, and select the format as "text." (You can also "grab" the data and copy to a word-processor file as you did in Activity 7.)

Heads Up!

*When you have a Web page up and select **File—Save As**, you can choose to save the source instead of the text. That is, you can save the actual HTML (hypertext markup language) code that is used to present the page you are looking at. You can look at the HTML code and see how the page was made as well as identify the links. This may be useful to you as you begin to design Web pages of your own.*

The stations with the longest records are the biggest files. Save a couple of the largest files (still only 6 kbytes). You should have at least three stations of CO_2 data.

Questions

9–5. Load the CO_2 data into a spreadsheet or graphing program. Plot the three stations' data on one plot. Do you see any trends in the data?

9–6. Do the longer data sets show a stronger trend than the shorter data sets?

Comparing CO_2 with CH_4 data

Return to the site and grab the methane (CH_4) data for **spo** (follow the instructions above, except go to the **ch4** directory instead of the **co2** directory).

Questions

9–7. What is the most noticeable difference between methane concentrations and carbon dioxide concentrations?

9–8. Load the CH_4 data into a spreadsheet or graphing program. What trends can you see in the data?

Jane learned a lot about the Web and at least a little about how science is done. We hope you did, too. Happy browsing!

Web Activities

Activity 1: Finding People in Cyberspace

Run a Web Browser

Use the Mail feature

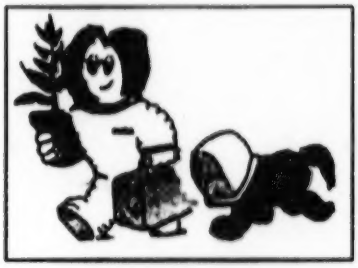
Browse for e-mail addresses

Activity 2: Finding Science on the Web

Conference with Browsers

Browse for subjects

Look for recent local earthquakes



Activity 3: The Space Shuttle

Investigate some of the NASA sites

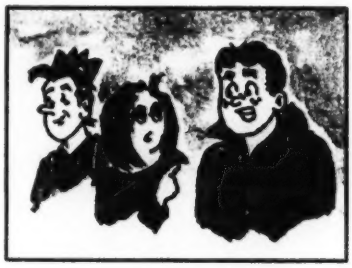
Visit Library Card Catalogs

Activity 4: Weather and Climate

Find local weather

Research El Nino

Track icebergs



Activity 5: Finding Programs

Search with **archie**

Transfer the file

Run a game or simulator

Activity 6: The Sun

Use veronica to search gopher sites

Look at images of the sun and a plot of sunspot number

Check High Frequency Radio Propagation reports

Look at images of an annular and a total eclipse

Activity 7: Hazards

Search an earthquake database for specific locations and losses

Search for volcano locations.

Grab data off the Web and plot it on your own computer

Look at plate tectonics and city lights

Activity 8: The Winds

Look at an elevation map of the country

Learn to read data on a weather map

Check the winds at 30,000 feet

Activity 9: Greenhouse Gases

Read about Greenhouse Gases

Look at plots of the Ozone hole

Download CO_2 data and plot it

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